

In addition, a first distance ( $d_{ref}$ ) from a top surface of the first reflective electrode **110** to a bottom surface of the first emission layer **130A** is approximately the same as a second distance ( $d_{ref}$ ) from a top surface of the second reflective electrode **110** to a bottom surface of the second emission layer (EML **130C**). For example, the first distance and the second distance are less than 50 nm.

[0032] A common electron transport layer (ETL) **122** may be located underneath the first emission layer **130A** and the second emission layer **130B**, and over the first reflective electrode **110** and the second reflective electrode **110**. Additionally, a common electron injection layer (EIL) **120** may be located underneath the common ETL **122**, and over the first reflective electrode **110** and the second reflective electrode **110**.

[0033] In an alternative configuration, a first ETL **120** is located underneath the first emission layer **130A** and over the first reflective electrode **110**, and a second ETL **120** is located underneath the second emission layer **130C** and over the second reflective electrode **110**.

[0034] A first distance ( $d_{ref}$ ) from a top surface of the first reflective electrode **110** to a bottom surface of the first emission layer **130A**, and a second distance ( $d_{ref}$ ) from a top surface of the second reflective electrode **110** to a bottom surface of the second emission layer **130C** are both less than 50 nm.

[0035] In an embodiment a common hole injection layer (HIL) **150** is located over the first HTL (**142**, **144A**) and the second HTL (**142**, **144C**).

[0036] The top electrode layer **160** may include a transparent conductive oxide (TCO) layer **164**, or a layer stack, such as a stack including a metal layer **162** and TCO layer **164**.

[0037] In accordance with embodiments, a first distance ( $d_{ref}$ ) from a top surface of the first reflective electrode **110** to a bottom surface of the first emission layer **130A** is at least an order of magnitude less than a primary peak of the first narrow band emission wavelength range. For example, the primary peak of the first narrow band emission wavelength range may be between 620 nm and 750 nm. In an embodiment, the first distance is less than 50 nm. In an embodiment, a second distance from a top surface of the second reflective electrode **110** to a bottom surface of the second emission layer **130C** is at least an order of magnitude less than a primary peak of the second narrow band emission wavelength range.

[0038] The display panel narrow band emission pixels in accordance with embodiments may include any number of subpixels. For example, a third subpixel may be included with a third reflective electrode **110**, a third emission layer **130B** over the third reflective electrode, the third emission layer designed **130B** for a third narrow band emission wavelength range that is different from the first narrow band emission wavelength range and the second narrow band emission wavelength range, and a third HTL **144B** characterized by a third thickness over the third emission layer, wherein the third thickness is different from the first thickness of the first HTL **144A** and the second thickness of the second HTL **144C**. As shown in FIG. 1, the semi-transparent or transparent top electrode layer **160** is over the first, second, and third hole transport layers.

[0039] In accordance with embodiments, third narrow band emission wavelength range is 35 nm or less full-width-at-half-maximum, a the third emission layer **13B** includes

quantum dots of a third composition (e.g. for green emission), the second reflective electrode **110** is more reflective to the second narrow band emission wavelength range than the top electrode layer **160**, and the third reflective electrode **110** is more reflective to the third narrow band emission wavelength range than the top electrode layer **160**.

[0040] In utilizing the various aspects of the embodiments, it would become apparent to one skilled in the art that combinations or variations of the above embodiments are possible for forming a narrow band emission pixel and display including the same. Although the embodiments have been described in language specific to structural features and/or methodological acts, it is to be understood that the appended claims are not necessarily limited to the specific features or acts described. The specific features and acts disclosed are instead to be understood as embodiments of the claims useful for illustration.

What is claimed is:

1. A display panel narrow band emission pixel comprising:

a first subpixel comprising:

a first reflective electrode;

a first emission layer over the first reflective electrode, the first emission layer designed for a first narrow band emission wavelength range; and

a first hole transport layer (HTL) characterized by a first thickness over the first emission layer; and

a second subpixel comprising:

a second reflective electrode;

a second emission layer over the second reflective electrode, the second emission layer designed for a second narrow band emission wavelength range that is different from the first narrow band emission wavelength range; and

a second HTL characterized by a second thickness over the second emission layer, wherein the second thickness is different from the first thickness; and

a semi-transparent or transparent top electrode layer over the first and second hole transport layers.

2. The display panel of claim 1, wherein the first narrow band emission wavelength range, and the second narrow band emission wavelength range are both 35 nm or less full-width-at-half-maximum.

3. The display panel of claim 2, wherein the first emission layer comprises quantum dots of a first composition, and the second emission layer comprises quantum dots of a second composition.

4. The display panel of claim 2, wherein the first reflective electrode is more reflective to the first narrow band emission wavelength range than the top electrode layer.

5. The display panel of claim 4, wherein a first distance from a top surface of the first reflective electrode to a bottom surface of the first emission layer is approximately the same as a second distance from a top surface of the second reflective electrode to a bottom surface of the second emission layer.

6. The display panel of claim 5, wherein the first distance and the second distance are less than 50 nm.

7. The display panel of claim 5, further comprising a common electron transport layer (ETL) underneath the first emission layer and the second emission layer, and over the first reflective electrode and the second reflective electrode.